

A revision of *Goodia* (Fabaceae: Bossiadeae)

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Introduction

Goodia Salisb. is a small genus of medium-sized to tall shrubs in the Australian-endemic tribe Bossiadeae of the Fabaceae. It can be distinguished from the other six genera in the tribe by the combination of its pinnately trifoliolate leaves and many-flowered racemes. The genus extends across the southern third of Australia, including Western Australia, South Australia, New South Wales, Victoria, and Tasmania. In addition, in far eastern Australia there is a northern extension to its distribution, with its northernmost limit almost reaching to the Tropic of Capricorn in south-eastern Queensland.

Until recently, *Goodia* had been phylogenetically isolated from other genera in the tribe. Phylogenetic analyses of Crisp and Weston (1987) using morphological data placed *Goodia* basally, as did analyses of Crisp and Cook (2003), using molecular data. However, Thompson (2011), when erecting the new genus *Paragoodia* I.Thomps., suggested that *Goodia* and *Paragoodia* may be sister taxa. The single species of the new genus was formerly placed in *Muelleranthus* Hutch., but was not included in the molecular study. *Goodia* and *Paragoodia* are the only two genera in the tribe to have pinnately trifoliolate leaves. Their flowers, unlike those in *Muelleranthus*, *Aenictophyton* A.T.Lee and *Ptychosema* Benth., do not have a distinct hypanthium. *Platylobium* Sm. and *Bossiadea* Vent. differ from all other genera in having brown scales subtending inflorescences. *Goodia* differs from the rest of the tribe, generally speaking, in having early caducous bracts and bracteoles. Stipules are caducous in half of the species of *Goodia*, whereas in the rest of the tribe stipules are generally persistent. Thompson (2011) presents a revised key to the tribe which includes the new genus *Paragoodia*.

Taxonomic History: *Goodia lotifolia* Salisb. was described in 1806, followed soon after by *G. pubescens* Sims. *Goodia medicaginea* F.Muell. was described in 1858 and no further new species have been described since. *Goodia pubescens* has sometimes been treated as a variety of *G. lotifolia*, most recently by Ross (1997), while *G. medicaginea*, although currently recognised as distinct, has sometimes been treated as a synonym of *G. lotifolia* (eg. Bentham 1864; Weber 1986). Further details of the taxonomic history are presented in Ross (1997).

Abstract

A revision of the Australian-endemic genus *Goodia* Salisb. (Fabaceae: Bossiadeae) is presented. Three new species are described: *Goodia macrocarpa* I.Thomps., *G. parviflora* I.Thomps., and *G. stenocarpa* I.Thomps. *Goodia lotifolia* Salisb. var. *pubescens* (Sims) H.B.Will. is returned to species status as *G. pubescens* Sims. A key to species and distribution maps are presented.

Keywords: morphology, taxonomy, biodiversity, flowering plants, peas.

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Methods

This study was based on the examination of herbarium material with the aid of a dissecting microscope. Pressed flowers were reconstituted using hot soapy water to facilitate their examination. Specimens from AD, BRI, CANB, HO, MEL, NE, NSW, and PERTH were examined. In addition, several populations of *Goodia* in New South Wales and Victoria were examined in the field, and collections from these populations were made. Unless otherwise indicated, images presented in this paper were taken by the author using a Canon PowerShot A2000 IS digital camera.

Results

The results of this morphological study are presented in the taxonomic section below. In summary, the pattern of variation identified in *Goodia* calls for three new species to be described and a return to species status for *G. lotifolia* var. *pubescens* (Sims) H.B. Will.

The most useful characters for taxonomic purposes recognised in this study include: density of indumentum and orientation of hairs on axes; size and persistence of stipules; length of leaf-rachides, and the shape, apiculum

size and indumentum of leaflets; lengths of pedicels, bracts, bracteoles and flower parts; degree of fusion of upper calyx-lobes; colour, marking pattern and relative lengths of petals; orientation of wing petals; number of ovules per ovary; size, shape and seed number of pods; the fleshiness of pod-valves and the prominence of their transverse venation; and the size of seeds and arils.

Taxonomy

Goodia Salisb., *Parad. Londin.* 1: t. 41 (1806)

Type: *G. lotifolia* Salisb.

Erect shrub to c. 4 m high, sometimes slightly glaucous, with a variably dense, variably persistent indumentum on branches, stipules, leaves, inflorescence axes, pedicels and calyces. *Stipules* lanceolate, herbaceous, caducous or persistent. *Leaves* alternate, pinnately trifoliolate, to c. 80 mm long, with petiole one-third to two-thirds of the total length; rachis up to half the length of leaflets; leaflets petiolulate; lamina elliptic, obovate, cuneate or occasionally obcordate, entire, thin, pinnately veined, with reticulate veins inconspicuous, mid- to dark-green or blue-green, discolourous; base cuneate; apex obtuse, rounded or truncate, with apiculum absent or

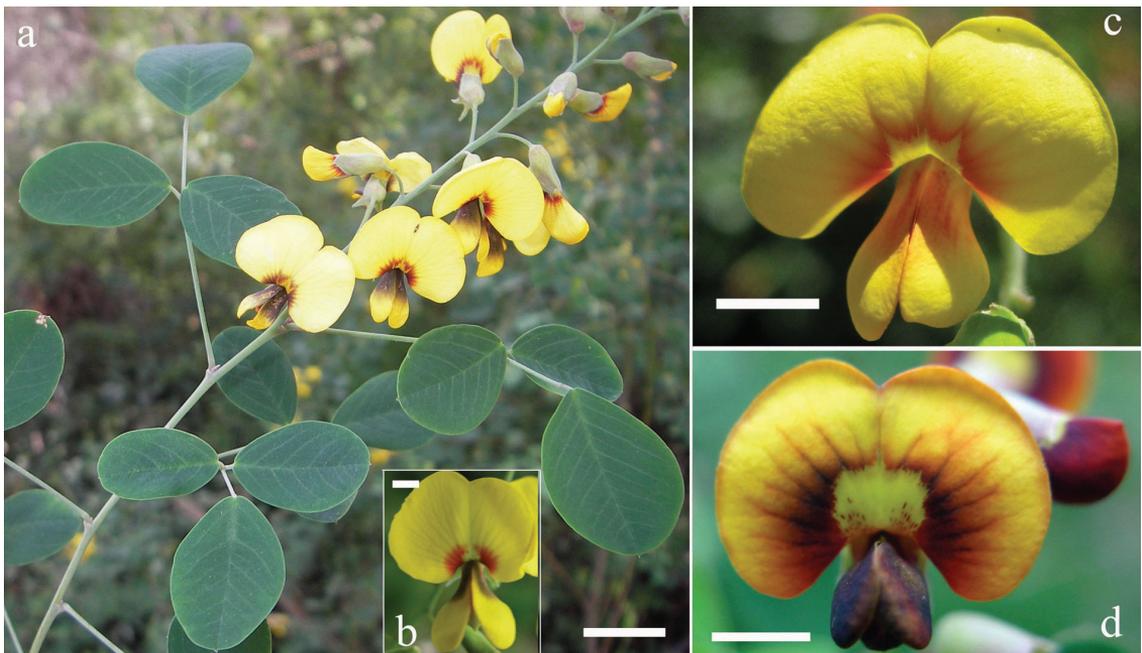


Figure 1. Flowers. a. *G. lotifolia* (northern form); b. *G. lotifolia* (cultivated, southern form); c. *G. macrocarpa* (I.R. Thompson 1339 MEL); d. *G. medicaginea* (cultivated, I.R. Thompson s.n., MEL). Photo credit: a. Lachlan Copeland. Scale bars: a = 10 mm, b = 2 mm, c = 5 mm, d = 3 mm.

small; terminal leaflet slightly larger than lateral leaflets. *Inflorescences* racemose, terminal, sometimes exceeded by sympodial growth, indeterminate, typically with 10–30 flowers; flowers pedicellate, with pedicels divergent to spreading; basal bract and bracteoles ±herbaceous, generally caducous well before anthesis; bracteoles lanceolate to linear, opposite or subopposite, inserted in distal half of pedicel. *Calyx-lobes* slightly shorter to slightly longer than tube; upper lobes equal to or slightly shorter but broader than lower lobes, forming a tapering lip; lower lobes triangular to very narrow-triangular, sometimes with median lobe slightly longer and narrower; petals clawed, with standard claw longest; standard and wings of similar length, yellow with red and/or purple-brown markings; standard-limb orbicular to oblate, broad-cuneate to shallowly cordate, moderately emarginate, with a flare around a greenish, red-flecked throat; wings straight, slightly upcurved or rarely downcurved, slightly narrower than the keel; keel slightly to markedly shorter than wings, yellow-green,

but often flushed reddish; keel-petals fused at distal end of lower margin, forming an obtuse or right angle with upper margin; stamens all fused into an adaxially open sheath, with the vexillary stamen sometimes less fused, and rarely becoming free; anthers dorsifixed, uniform in size, orange; ovary stipitate, glabrous except in *G. medicaginea*, (1–)2–6-ovulate; style upcurved with stigma minute, hardly broader than the slender style-terminus. *Pods* generally long-stipitate; body elliptic, oblong to narrow-oblong or rhomboidal in profile, moderately compressed, with a short beak, 1–6-seeded, glabrous at maturity; upper suture sometimes ridged or winged; valves coriaceous, remaining convex or flattening post-dehiscence; funicles 1–3 mm long, curved. *Seeds* ellipsoid, plump, black at maturity (dark-brown when nearly mature); aril 20–50% of length of seed, inserted laterally, with base ring-shaped, open at one end, with an overarching vertical lobe.

Notes on morphology: Examples of the morphology of *Goodia* are presented in figures 1 and 2.

Key to species

Note: Purple-brown petal markings appear purple in pressed specimens; these markings may become lost in older pressed specimens.

- 1 Abaxial surface of standard predominantly bright yellow; wings yellow distally; seeds with aril-base 1.2–2.5 mm long.....**2**
- 1: Abaxial surface of standard mostly purple-brown grading to reddish orange towards margin; wings purple-brown distally; seeds with aril-base 0.5–1.2 mm long.....**4**
- 2 Inflorescence axes, branchlets, and petioles glabrous or nearly so when mature; stipules early caducous.....**1. *G. lotifolia***
- 2: Inflorescence axes, current season branchlets and petioles with indumentum moderately dense when mature; stipules caducous or persistent.....**3**
- 3 Stipules tending to persist, 1–3 mm long; wings 12–15 mm long; ovaries mostly 3–6-ovulate; body of pods oblong, to 40 mm long, with fine venation raised at least when dry (northern New South Wales and southern Queensland).....**2. *G. macrocarpa***
- 3: Stipules early caducous, 5–7 mm long; wings 8–9 mm long; ovaries mostly 2-ovulate; body of pods c. elliptic, to 25 mm long, with venation obscure (Victoria and Tasmania)..... **3. *G. pubescens***
- 4 Stipules early caducous; abaxial surface of leaflets with persistent scattered, short appressed hairs; upper lip of calyx truncate or with sinus rounded or broadly obtuse; ovary and young fruit almost always with hairs along sutures; pods elliptic in profile.....**4. *G. medicaginea***
- 4: Stipules somewhat persistent; abaxial surface of leaflets becoming glabrous or with hairs persisting about midrib only; upper lip of calyx with sinus obtuse to acute; ovary glabrous; pods c. oblong in profile..... **5**
- 5 Indumentum moderately dense, with hairs spreading, 0.5–1 mm long; calyx 3–5 mm long; pods 6–7 mm wide (Western Australia).....**5. *G. stenocarpa***
- 5: Indumentum sparse, with hairs appressed, 0.2–0.5 mm long; calyx 2–3 mm long; pods 9–10 mm wide (Queensland).....**6. *G. parviflora***

PETALS: Differences in the markings of the standard and wing petals separate the six species of *Goodia* into two groups of three, as shown in the key to species. These differences are evident in figures 1a–d. Flowers of *G. lotifolia* shown in profile in bud show a mostly yellow abaxial surface of the standard (Fig. 1a), whereas the profile of flowers of *G. medicaginea* shows the abaxial surface to be reddish all over (Fig. 1d). A similar distinction between species in extent of red pigmentation is evident for the adaxial surface. The wing is yellow distally in *G. lotifolia* (Figs 1a–c), whereas it is purple-brown in *G. medicaginea* (Fig. 1d).

The three species with a predominantly bright yellow standard commonly have longer flowers than the other three species; however, flowers of *G. medicaginea* may be longer than those of *G. pubescens* and, less often, of *G. lotifolia*.

LEAVES: Smaller leaves of short lateral branches may have a very short rachis and superficially appear to be digitately trifoliate. This is most commonly seen in *G. pubescens* and in southern forms of *G. lotifolia*.

INFLORESCENCES: The more basal buds of inflorescences often abort and fall before anthesis. The prominent abscission scars of bracts mark their position. Similarly, a cluster of apical buds that fail to develop beyond a rudimentary size are sometimes evident. Racemes are all terminal in that they terminate branches. However, they sometimes appear to be axillary because of extensive sympodial growth (shoot development from the axil of the terminal leaf). Such racemes are variously called pseudoaxillary or leaf-opposed.

PODS: A comparison of pods and seeds of all species are presented in figures 2a, 2b and 2d. The scale is slightly larger in figure 2b compared to 2a. In general, pods of the smaller flower group are smaller than in the large flowered group. The nature of the connection of the aril to the funicle is shown in figure 2c. This arrangement occurs in all genera of the tribe Bossiaeeae. In figure 2d, the different lengths (top row longer) of the base of the aril is the main difference of significance. The greater overhang of the lobe in *G. medicaginea* and *G. stenocarpa* (bottom row) is also a significant difference.

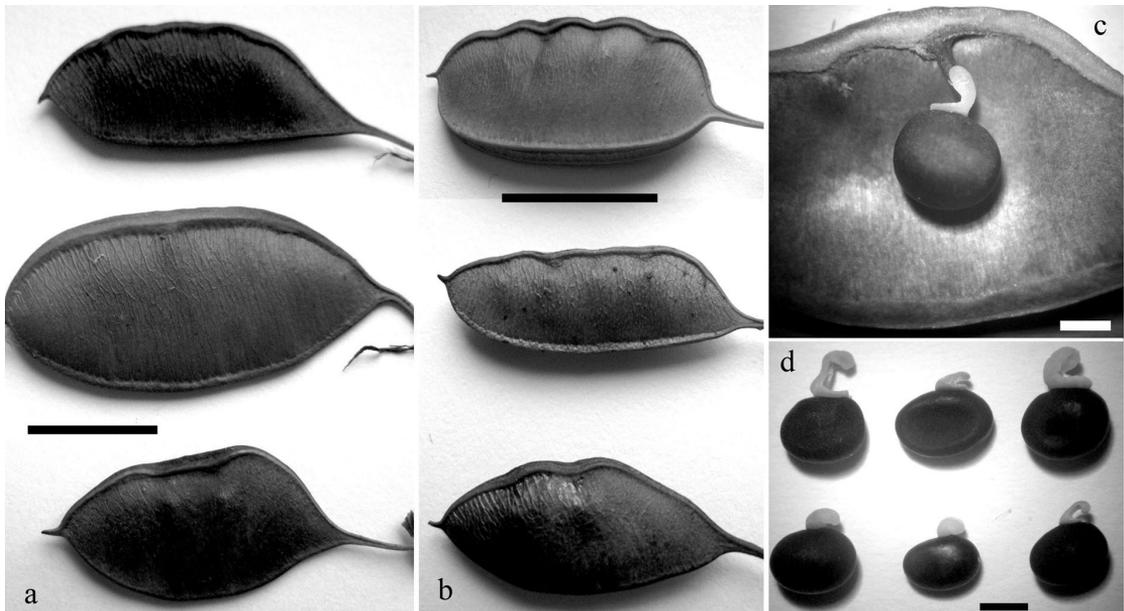


Figure 2. a–b. Pods: a. (top to bottom) *G. lotifolia* (A.C.Beaglehole 67453 MEL), *G. macrocarpa* (A.R.Bean 23387 BRI), *G. pubescens* (J.H.Ross 3702 MEL); b. (top to bottom) *G. parviflora* (A.R.Bean 10159 BRI), *G. stenocarpa* (B.Archer 1441 MEL), *G. medicaginea* (J.Strudwick 252 MEL). c–d. Seeds: c. *G. lotifolia* (New South Wales southern highlands form), pod and attached seed (I.R.Thompson 1199 MEL); d. (L to R) top row: *G. lotifolia* (A.H.A.Beetham MEL), *G. macrocarpa* (Wilcox MEL), *G. pubescens* (J.H.Ross 3703 MEL); bottom row: *G. medicaginea* (B.Bainbridge s.n. MEL), *G. stenocarpa* (B.Archer 1441 MEL), *G. parviflora* (A.R.Bean 10159 BRI).

Scale bars: a–b = 10 mm, c–d = 2 mm.

The different degrees of arching of the vertical lobe of the aril in these examples is not significant; this feature varies within species.

1. *Goodia lotifolia* Salisb., *Parad. Londin.* 1: t. 41 (1806)

Type: Cult. Seed collecting locality unknown [possibly Arthurs Seat in Victoria in April 1802], *P.Good*, 1802; icono: t. 41, *loc. cit.*

Goodia latifolia as given by Colla in *Hortus Ripulensis* 1: 62 (1824) is probably an orthographical error for *G. lotifolia*.

Shrubs to c. 4 m high, with a sparse appressed pubescence on new growth, becoming glabrous or very sparsely hairy; hairs \pm appressed, to 0.3 mm long. *Stipules* early caducous, narrow-lanceolate, 1–8 mm long, 1–1.5 mm wide. *Leaves:* petiole 30–70% of total length; rachis to c. 10 mm long; lamina of terminal leaflet elliptic to obovate, 10–30 mm long, 6–30 mm wide, 3–10 times length of rachis, with l:w ratio mostly 1–1.5; apex rounded, truncate or emarginate, with apiculum minute or to c. 1 mm long; upper surface glabrous; lower surface soon glabrescent or short appressed hairs somewhat persistent. *Inflorescence axes* to c. 14 cm long; bracts 1.5–5 mm long; pedicels 3–12 mm long; bracteoles 1–3 mm long. *Calyx* 3.5–7 mm long, glabrous or sparsely hairy; upper lip with sinus broadly obtuse to acute, or occasionally subtruncate, mostly 0.5–1.5 mm deep, 1–2.5 mm wide, lower lobes (1.5–)2.5–3.5 mm long, with median lobe sometimes longer; standard 10–16 mm long, 12–18 mm wide; claw 3–6 mm long; limb c. circular or oblate; adaxial and abaxial surfaces bright yellow except for a red flare to 2 mm wide surrounding throat or as patches at sides of throat, purple-brown pigment absent or in small amounts; throat 1–3 mm wide, squarish; wings 8–14 mm long, 3–5 mm wide, yellow throughout, or variously marked red basally, purple-brown or grey-brown basally and centrally; keel 7–12 mm long, 3–5 mm wide, yellow-green throughout or flushed red at apex or more extensively; anthers 0.6–1 mm long; ovary (1–)2–4(–5)-ovulate, style 2.5–4 mm long. *Pods:* stipe 5–15 mm long; body rhomboid-elliptic, obovate, or occasionally oblong in profile, 15–35 mm long, 7–13 mm wide, mid-brown or dark reddish-brown, 1–4-seeded; upper suture with a ridge or wing to c. 1.5

mm high; apex rounded to acute, with beak 1–3 mm long; outer valve surface with venation conspicuously raised when dry, inner valve surface with suture zone 1–2 mm wide, undulate when 3 or more-ovulate; funicle slightly curved. *Seeds* 3–5 mm long; aril 1.2–2.5 mm long, 1.2–2 mm high, with base 1.2–2.5 mm long; lobe not usually overhanging base, with tip mildly curved.

Selected specimens from c. 300 examined: QUEENSLAND: First Creek towards Mackenzies [near Kilcoy], *L.Leichhardt*, 1843 (NSW); Harland Rd, Mt Glorious, *A.R.Bean* 2159, 18.viii.1990 (BRI, MEL1597059); 0.3 km along K break, Mt Mee State Forest, near Mt Mee, *A.R.Bean* 14394, 3.xii.1998 (BRI). **NEW SOUTH WALES:** The Scrub picnic area off the Colongon Fire trail, c. 18 km SE of Tenterfield, *R.G.Coveny* 16588 & *A.J.Whalen*, 15.x.1993 (AD, BRI, CANB, HO, MEL281231, NSW); Giro State Forest on the Walcha–Gloucester Rd, *A.R.Bean* 11469, 10.xii.1996 (BRI, MEL249368, NSW); Road to TV telecommunication towers, c. 7 km W by road from Princes Hwy, Middle Brother National Park, *I.R.Thompson* 1349, 26.xi.2010 (AD, BRI, CANB, MEL); c. 500 m up steep slope from Marble Arch, Deua National Park, *T.R.Lally* 171, 24.x.1993 (CANB, NE, NSW); Mt Cambewarra, *E.F.Constable s.n.*, 7.xii.1950 (NSW); 0.5 km E of junction of Mellion Ck and Tuross R., *M.D.Crisp* 2190, 25.ix.1976 (AD, CANB); 0.5 km S of Mt Armour, Kanangra-Boyd National Park via Oberon, *A.R.Bean* 17142, 19.xii.2000 (BRI); NE of Mt Armour, Armour Range, *J.Pickard* 402 & *S.Pickard*, 21.ix.1969 (NSW); Bendethera Caves fire trail, 63 km SSW of Braidwood, *R.G.Coveny* 5970 & *A.N.Rodd*, 15.i.1975 (MEL2090167, NSW); Tallaganda State Forest, road to Parkers Gap from Captains Flat, *A.M.Lyne* 1606, 29.x.1995 (CANB, MEL2090170, NSW). **AUSTRALIAN CAPITAL TERRITORY:** Slopes of Mt Tidbinbilla on path to Kangaroo Gap, *N.T.Burbidge* 5593, 17.iii.1957 (CANB, MEL). **VICTORIA:** Warburton, *J.C.H.Adler*, 21.ix.1921 (MEL663881); near the Latrobe R. between Neerim and Fumina, *A.H.A.Beetham*, xii.1950 (MEL1058073); Mt Oberon, Wilsons Promontory, *J.Galbraith*, 20.iii.1957 (MEL594055); Burgess Rd, 6.4 km E of junction with Link Rd, Bunyip State Park, *P.C.Jobson* 3727 & *J.C.Reid*, 7.ix.1995 (AD, BRI, CANB, MEL2027089, NSW); Wait-a-while track, SE of Lavers Hill, *K.Macfarlane* 178, 9.x.1996 (AD, CANB, HO, MEL2034975, NSW). **TASMANIA:** Cape Barren Island, *J.S.Whinray* 618, 27.x.1973 (MEL529377); Road into Great Musselroe R., S section of "The Branches", *M.Visoiu* 416, 12.i.2008 (CANB, HO); Road to Jetty, Bridport, *D.M.Paton*, 6.ix.1948 (HO); Mt Wellington, Lower Valley, *L.Rodway* 173, xii.1927 (HO); Deceitful Cove, George Town, *A.M.Buchanan* 13442, 28.ix.1993 (HO).

Flowering period: Flowers mostly late winter to mid spring.

Distribution and habitat: Occurs in south-eastern Queensland, eastern New South Wales, southern Victoria, and Tasmania (Fig. 3). Grows in medium to tall forest.

Notes: There is a moderate degree of geographic variation in *G. lotifolia*; however, the variation appears to be insufficiently discrete to warrant infraspecific taxonomic recognition. In northern localities, north of Taree in New South Wales and extending into Queensland, the wing and keel petals are generally more extensively marked red and purple-brown, the standard throat is broader and the lower lobes of the calyx generally are not longer than the upper lobes. In populations in the southern highlands of New South Wales, eg. Cambewarra Mountain, the indumentum tends to be more persistent, flowers tend to be smaller, pods have fewer but larger seeds and the funicle is entirely red, ie. oriented so that the white-granular part is not evident (Fig. 2c). In populations in far southern New South Wales, Victoria and Tasmania, flowers have relatively long wing and keel petals with less extensive red and purple-brown markings, the wings tend to be downcurved, stipules are longer, and the apiculum of leaflets is generally more prominent.

Spongiose tissue arising from the inner surface of pod valves and surrounding seeds has occasionally been recorded in *G. lotifolia*. This appears to be homologous to the partitions seen in some species of *Bossiaea*, eg. *B. heterophylla*.

Typification: The iconotype is a drawing of a plant grown from seed collected by Peter Good. However, the provenance of the seeds is not known. The only possible

localities appear to be King Island in Bass Strait, Port Phillip Bay in Victoria and Port Jackson (Sydney area) in New South Wales. In all cases the times Good was present, April to June, were unlikely times for seeds to be remaining on plants, although a summer flowering, following the normal spring flowering, is known to occur in *G. lotifolia*. The protologue describes the plants grown from seed, and it suggests that the southern form was collected based on the description of long stipules and the standard with a pair of red markings above the claw (as distinct from a continuous semicircular flare).

2. *Goodia macrocarpa* I.Thomps., sp. nov.

A G. pubescens Sims stipulis persistentibus brevioribus, vexillo longiore, sinu calycum latiore, leguminibus longioribus, venis expressis differt; a *G. lotifolia* Salisb. plantis pubescentibus, stipulis persistentibus, leguminibus plerumque longioribus differt.

Type: New South Wales. Pinanpinga fire trail, Knorrit State Forest, c. 25 km W of Wingham, A.R.Bean 23387, 30.xii.2004; holotype: BRI 698082.

Shrubs to c. 3 m high, with a moderately dense, persistent pubescence on current season's growth; hairs divergent or appressed, to c. 0.3 mm long. *Stipules* somewhat persistent, narrow-lanceolate, 1–3 mm long, 0.3–0.5 mm wide. *Leaves:* petiole 40–50% of total length; rachis to c. 10 mm long; lamina of terminal leaflet narrow-elliptic to elliptic, 20–30 mm long, 15–20 mm wide, 3–8 times length of rachis, with l:w ratio 1.6–2; apex rounded, with apiculum minute; upper surface glabrous or nearly so; lower surface usually with

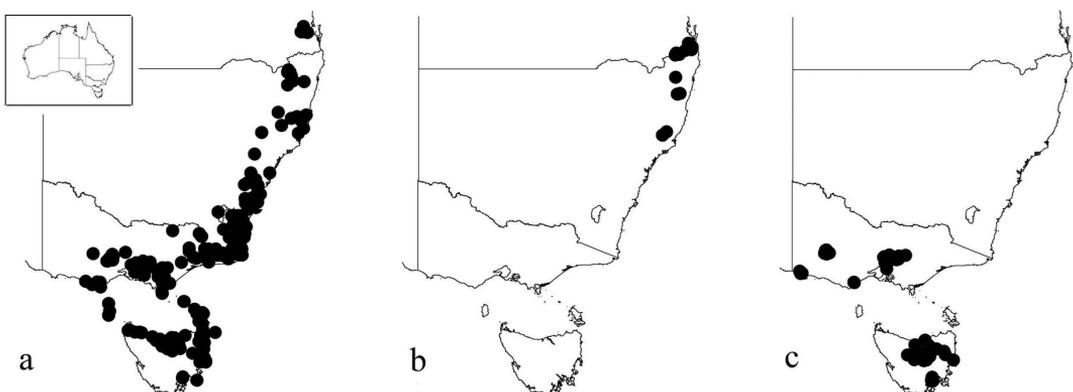


Figure 3. Distributions in south-eastern Australia of a. *Goodia lotifolia*, b. *G. macrocarpa*, and c. *G. pubescens*.

scattered short appressed hairs. *Inflorescence axes* to c. 9 cm long; bracts 1.5–4 mm long; pedicels 3–10 mm long; bracteoles 1–2 mm long. *Calyx* (4–)4.5–7 mm long, with hairs sparse to scattered, appressed; upper lip with sinus acute to obtuse, 0.5–1 mm deep, 1.5–3 mm wide; lower lobes 2–3 mm long, all similar in length; standard 12–16 mm long, 15–18 mm wide; claw 4–5 mm long; limb oblate; adaxial and abaxial surfaces bright yellow except for a red flare to 2 mm wide surrounding throat, purple-brown pigment absent or in minute amounts; throat 4–5 mm wide, somewhat rounded at sides, with 2 triangular points at summit; wings 12–15 mm long, 3.5–4.5 mm wide, red in proximal two-thirds, yellow in distal third; keel 10–11 mm long, 4–4.5 mm wide, with a light red flush in distal half to two-thirds, without a line of red adjacent to lower margin; anthers c. 1 mm long; ovary 3–6-ovulate, style 3.5–4 mm long. *Pods*: stipe 10–15 mm long; body oblong to oblong-elliptic, mostly 20–40 mm long, 10–15 mm wide, brown, mostly 3 or 4-seeded; reddish-brown; upper suture with a low broad ridge to c. 0.8 mm high; apex obtuse to subacute, with beak 1–2 mm long; outer valve surface with venation slightly raised when dry; inner valve surface with suture zone 1–1.5 mm wide, \pm straight; funicle curved. *Seeds* c. 4 mm long; aril 1.5 mm long, c. 1.2 mm high, base 1.2–1.5 mm

long, lobe not or only slightly overhanging, with tip c. 0.5–1 mm above seed-surface.

Selected specimens of c. 35 examined: QUEENSLAND:

“The Panorama” at Gilston, *G.Leiper*, 25.xi.2004 (BRI); Boundary of SF735, Drummer and Border section of Mt Barney National Park, *P.Grimshaw G993 & G.Turpin*, 28.ix.1994 (BRI); Numinbah Forest Reserve, N end of Springbrook Plateau, *D.A.Halford Q9118*, 29.vii.2006 (BRI, MEL2332467); Canungra to Mt Tamborine Rd, c. 2 km S of Mt Tamborine, *W.J.F.McDonald 1496 & W.G.Whiteman*, 29.vii.1976 (BRI). **NEW SOUTH WALES:** Coffs Harbour, *J.H.Maiden & J.L.Boorman*, xi.1903 (NSW); Track to Nothofagus Mountain, c. 11.3 km N of Woodenbong, *R.Coveny 5172*, 5.ix.1973 (BRI, NSW); McPherson Range, Mt Lindsay State Forest, *I.R.Telford 2684*, 4.x.1970 (CANB); Nymboi-Binderay National Park, 5.0 km along Pilot Knob Fire Trail from turn-off on Black Mountain Rd, *M.D.Crisp 10362*, 24.xi.2006 (CANB); Welsh’s Rd, Clouds Creek SF, N of Dorrigo, *A.R.Bean 16857*, 9.ix.2000 (BRI, NSW); c. 1 km along Pinanpinga Fire Trail, off Knodingbul Forest Rd, Knorrit State Forest, *I.R.Thompson 1340*, 25.xi.2010 (MEL).

Flowering period: Main flowering time late winter to early spring; also flowers late spring to summer.

Distribution and habitat: Occurs in far south-eastern Queensland S of Tamborine, and in north-eastern New South Wales as far S as Wingham (Fig. 3). Grows in tall forest.

Etymology: The epithet refers to the relatively large pods (From Greek: *macro-*, large, and *carpos*, fruit).

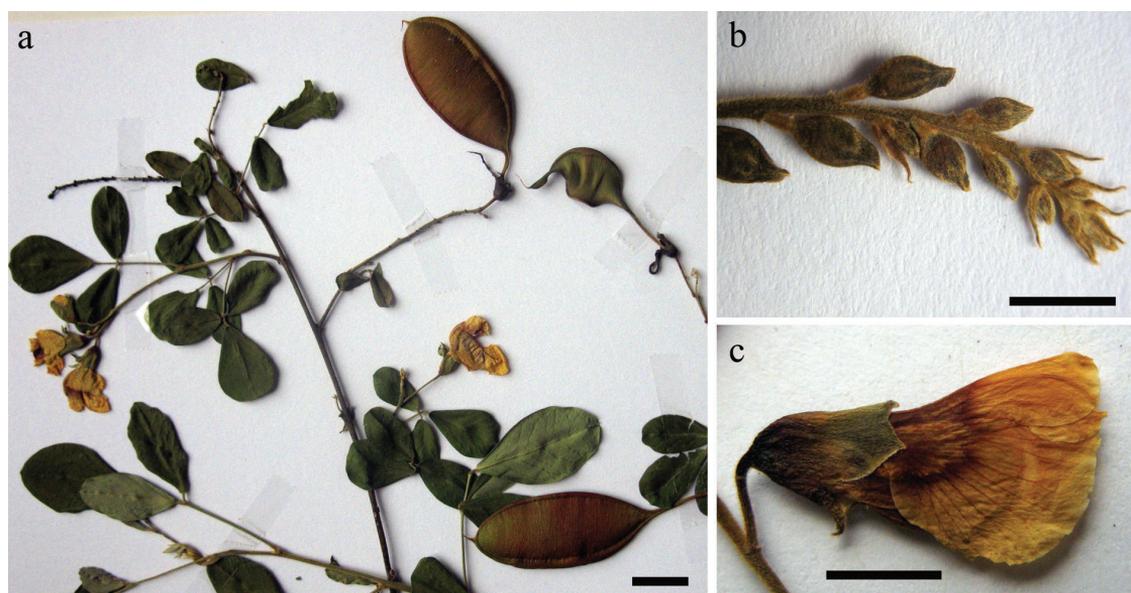


Figure 4. *Goodia macrocarpa*. a. portion of holotype (A.R.Bean 23387 BRI); b. developing raceme; c. flower (b. & c. R.Coveny 5172 MEL). Scale bars: a = 10 mm, b–c = 5 mm.

Notes: The only other species of *Goodia* with a similar indumentum to that of *G. macrocarpa* is *G. pubescens*. These two species are separated by over 1000 km. *Goodia macrocarpa* has the largest fruit in the genus and is the only species with wings that have bright red markings rather than purple-brown or grey-brown (Fig. 1c). The pubescence is not obvious to the naked eye except on new growth, but examination under low power shows that the indumentum is significantly denser than ever seen in *G. lotifolia*. Stipule persistence also distinguishes *Goodia macrocarpa* from *G. lotifolia*, *G. pubescens* and *G. medicaginea*. Compared to all other species of *Goodia*, the stipules are relatively short, narrow and hairy. *Goodia macrocarpa* occurs in similar habitats to that of *G. lotifolia*. Some features of the morphology of *G. macrocarpa* are presented in figure 4.

3. *Goodia pubescens* Sims, *Bot. Mag.* 32: t. 1310 (1810).

Goodia lotifolia var. *pubescens* (Sims) H.B.Will., in A.Ewart, *Fl. Victoria* 658 (1931)

Type: Tasmania. Locality unknown, iconotype: t. 1310 loc. cit.

Goodia subpubescens Sweet, *Hort. Brit.* 110 (1826), *nom. nud.*

Shrubs to c. 2 m high, with a moderately dense to dense, persistent pubescence on current season's growth; hairs spreading to appressed, 0.3–0.5 mm long. *Stipules* early caducous, oblong-lanceolate, 3–7 mm long, c. 1 mm wide. *Leaves:* petiole 40–50% of total length; rachis to c. 8 mm long, sometimes not developed in smaller leaves; lamina of terminal leaflet narrow-elliptic to elliptic or narrow-obovate to obovate, 10–40 mm long, 6–20 mm wide, 4–12 times length of rachis (or rachis hardly developed), with l:w ratio 1.4–2.5; apex rounded, truncate or retuse, with apiculum absent or minute; upper surface glabrous or with sparse to scattered, loosely appressed to antrorse divergent hairs; lower surface with scattered appressed hairs. *Inflorescence axes* to c. 9 cm long; bracts 2–3 mm long; pedicels 3–8 mm long; bracteoles c. 2 mm long. *Calyx* 4–6.5 mm long, moderately hairy, with hairs appressed; upper lip with sinus acute, 0.8–1.2 mm deep, 1–1.5 mm wide; lower lobes 2–4 mm long, with median lobe generally distinctly longer than lateral lobes; standard 9–12 mm long, 10–14 mm wide; claw

3–4 mm long; limb orbicular to oblate, adaxial and abaxial surfaces bright yellow with a red flare to c. 2 mm wide mostly surrounding throat, purple-brown pigment present in flare in moderate amounts and radiating a short distance along nerves; throat c. 2.5 mm wide, squarish; wings 8–10 mm long; 3–4 mm wide, purple-brown in proximal half, yellow in distal half; keel 7–8 mm long, c. 3 mm wide, red nearly throughout; anthers c. 0.7 mm long; ovary mostly 2-ovulate, style 2.5–3 mm long. *Pods:* stipe 3–10 mm long; body narrow-elliptic to elliptic, 10–20 mm long, 9–11 mm wide, reddish-brown, mostly 2-seeded; upper suture usually with a ridge to c. 1 mm high; apex obtuse to subacute, with beak 1–2 mm long; outer valve surface with veins generally obscure when dry, inner valve surface with suture zone c. 1 mm wide, not undulate; funicle slightly curved. *Seeds* c. 4 mm long; aril 1.5–2 mm long, 1.5–2 mm high, with base 1.2–2 mm long; lobe not overhanging, mildly curved.

Selected specimens of c. 70 examined: VICTORIA:

Junction of Acheron Way and Marysville Rd, 10 km SW of Marysville, *P.C.Jobson* 3279, *A.W.Douglas & J.H.Ross*, 27.x.1994 (MEL2037933, NSW); Halls Gap–Mt Victory Rd, 3 km SW of Halls Gap, Grampians National Park, *J.H.Ross* 3799, 22.ix.1996 (AD, HO, MEL2034885); Kaanglang Rd, 6 km SSE of Forrest, *S.G.Harris* 72, 10.x.1985 (AD, CANB, HO, MEL2090174, NSW); Along the Mt Richmond to Greenwald Rd, S of the Surry R., c. 1.5 km E of Wrights Swamp, *H.I.Aston* 748, 22.x.1960 (MEL720961); Redmans Rd, 12 km SE of Halls Gap, *A.C.Beauglehole* 67076, 7.xii.1979 (MEL646800). **TASMANIA:** Archers Sugarloaf, *A.Moscal* 12499, 25.ii.1986 (HO, MEL722665); Cataract Gorge, Launceston, *F.E.Burbury*, 15.ix.1911 (HO); Kingston–Longley Rd, *F.H.Long* 965, 2.xi.1931 (HO); Woods Lake, Central Plateau, *A.Moscal* 719, 10.iii.1981 (HO, MEL596697); Cummings Creek, East Arm, East Tamar, *A.M.Buchanan* 16744, 20.ix.2007 (HO).

Flowering period: Flowers in spring.

Distribution and habitat: Occurs in southern Victoria and Tasmania (Fig. 3). Grows in forest.

Notes: Apart from features indicated in the key, *G. pubescens* can often be distinguished from *G. macrocarpa* and *G. lotifolia* by the relatively short rachis and relatively narrow leaflets of its leaves, by the hairs that sometimes persist on the upper surface of leaves, by the median calyx-lobe which is longer than the lateral ones by a greater amount, and by the pods which are less prominently ridged along the upper margin. In Tasmania, plants generally have smaller leaves, flowers and seeds, and the pods have a shorter stipe.

4. *Goodia medicaginea* F.Muell., *Fragm.* 1: 10 (1858)

Type: Victoria. Locality unknown [Australia Felix], F.Mueller; lectotype: MEL 237139, *vide* J.H.Ross, *Muelleria* 10: 6 (1997).

Shrubs to c. 3 m high, with a sparse to moderately dense, variably persistent pubescence on current season's growth; hairs appressed or divergent, to 0.3 mm long. *Stipules* early caducous, oblong-lanceolate, 2–5 mm long, c. 1 mm wide. *Leaves:* petiole 30–50% of total length; rachis to 18 mm long; lamina of terminal leaflet elliptic, orbicular, oblate, or obovate, 10–30 mm long, 8–25 mm wide, (1.5–)2–6 times length of rachis, with l:w ratio 0.9–1.5(–2); apex obtuse to truncate or retuse, with apiculum to c. 0.5 mm long; upper surface glabrous; lower surface with persistent short, appressed hairs. *Inflorescence axes* to c. 14 cm long, mostly < 10 cm long; bracts 2–6 mm long; pedicels 3–10 mm long; bracteoles 1.5–4 mm long. *Calyx* 3–5.5 mm long, hairy; upper lip c. truncate or with sinus broadly rounded or broadly obtuse, to 0.7 mm deep, 1.5–2.5 mm wide;

lower lobes 1–2.5 mm long, all similar in length; standard 7–12 mm long, 8–12 mm wide, claw 3–5 mm long, limb oblate, adaxial surface yellow or orange-yellow with a red and purple-brown flare c. 2 mm wide surrounding throat, abaxial surface with purple-brown to orange-red zone extending almost to margin; throat 2–2.5 mm wide, squarish; wings 6–10 mm long, c. 3 mm wide, purple-brown throughout; keel 6–8.5 mm long, c. 3 mm wide, red throughout; anthers c. 0.6 mm long; ovary with scattered hairs, mostly on sutures (and variably persistent as fruit develops), 2- or less often 3–4-ovulate, style 2–3.5 mm long. *Pods:* stipe 5–15 mm long; body narrow-elliptic to elliptic to sub-rhomboid, 10–25 mm long, 7–12 mm wide, glabrous, reddish-brown, 2(or 3)-seeded; upper suture not ridged, or occasionally with ridge to c. 0.5 mm high; apex obtuse to subacute, with beak c. 0.5–1 mm long (slender style remnant sometimes contributing a further 1 mm); outer valve surface with raised venation usually evident when dry, inner valve surface with suture zone c. 0.8 mm wide, undulate; funicle moderately curved. *Seeds* 3–4 mm long; aril 1.5–2 mm long, c. 1 mm high, with base

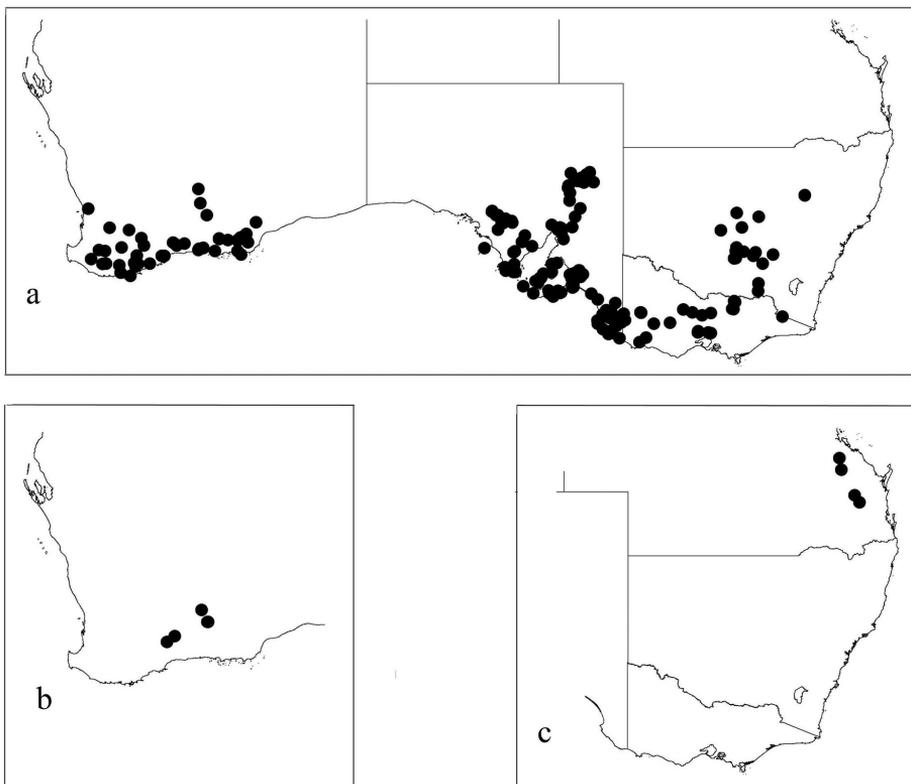


Figure 5. Distributions of a. *Goodia medicaginea*, b. *G. stenocarpa*, and c. *G. parviflora*.

0.8–1 mm long; lobe overhanging base and strongly curving down to seed surface.

Selected specimens of more than 300 examined: **WESTERN AUSTRALIA:** S of Pine Hill Campsite, 20 km N of Mt Ragged, E of Esperance, *D.J.Edinger 6069*, 33.x.2006 (PERTH); Cobertup Nature Reserve, *G.J.Keighery 15439*, 28.viii.1998 (PERTH); Parmango Rd, 91.9 km E of Condingup, *B.Archer 2391*, 2.x.2003 (CANB, MEL2221248 & MEL2221249, PERTH); Ongerup, *K.Newbey 334*, 19.viii.1962 (PERTH). **SOUTH AUSTRALIA:** Koondoolka, North-West Section of Gawler Range, *J.Z.Weber 3077*, 23.ix.1972 (AD, MEL2090101); Kellidie Bay Conservation Park, Eyre Peninsula, *S.Williams CBP179*, 6.ix.2000 (AD); Naracoorte Cave Conservation Park, intersection of Mt Gambier and Caves Rds, *J.H.Ross 3697*, 14.xii.1995 (MEL2030313, MEL2030314); Near mouth of gorge of Arcoona Ck, Gammon Ra., *H.Eichler 12674*, 17.ix.1956 (AD); Mt Torrens–Tepko Rd, Rockleigh, *K.H.Brewer 17*, 18.xii.2005 (AD). **NEW SOUTH WALES:** Lange’s property, 10 km W of West Wyalong, *C.Betteridge*, 21.viii.1973 (AD, NSW); W of Mt Brogden, Cocopara National Park, c. 20 km E of Griffith, *M.Fox 8208511* & *H.Fallding*, 14.ix.1982 (NSW). **VICTORIA:** Killawarrah Forest, near Wangaratta, *R.Thomas 637*, 1993 (MEL2025913); 2.5 km WSW of Mt Napier, *A.C.Beauglehole 56889* & *L.K.M.Elmore*, 16.x.1977 (MEL1508158); Tallageira State Forest, *J.A.Jeanes 1240*, 13.x.2002 (MEL2199221).

Flowering period: Flowers late winter to spring.

Distribution and habitat: Occurs in southern Western Australia, southern South Australia, New South Wales and Victoria (Fig. 5). Grows in woodland and open forest.

Notes: Two features that usually readily identify *G. medicaginea* are the truncate upper calyx-lip and the scattered hairs on the ovary and developing pod. The scattered hairs are predominantly in the proximal half of the upper suture, and are virtually always developed. However, specimens with glabrous ovaries have been recorded from the Cocopara and Warrumbungle Ranges in New South Wales. The hairs persist for some time following flowering, but are generally lost at fruit maturity. Also distinctive in *G. medicaginea* are the branches which commonly become reddish and finely rugose or verrucose with age. Leaves have a relatively long rachis, particularly when compared to those of *G. pubescens* in Victoria where the two species co-occur. In the Flinders Ranges of South Australia, plants often have relatively large leaves with exceptionally long leaf-rachides.

5. *Goodia stenocarpa* I.Thomps., sp. nov.

A G. medicaginea F.Muell. *pilis longioribus patentibus, foliolis inferne et calycis propemodo glabris, leguminibus oblongis differt.*

Type: Western Australia. New Norseman–Hyden Track, 31 km W of Norseman Post Office, *B.Archer 1309*, 8.viii.1999; holotype: MEL 2068447; isotype: PERTH n.v.

Shrubs to c. 1 m high, with a moderately dense, persistent pubescence on current season’s growth; hairs spreading, 0.6–1 mm long. *Stipules* somewhat persistent, lanceolate, to 7 mm long, 1.5 mm wide. *Leaves:* petiole 50–60% of total length; rachis 2–7 mm long; lamina of terminal leaflet obovate, 10–25 mm long, 8–20 mm wide, with l:w ratio 1–1.4, 3–5 times length of rachis; apex rounded, truncate or retuse, with apiculum to c. 0.3 mm long, sometimes triangular; upper surface glabrous; lower surface glabrous except for a few hairs along midrib and sometimes margin. *Inflorescence axes* to c. 10 cm long; bracts c. 5 mm long; pedicels 4–8 mm long; bracteoles 1–4 mm long. *Calyx* 4–5 mm long, glabrous or nearly so except for margins; upper lip with sinus acute, c. 0.8 mm deep, c. 1 mm wide; lower lobes 2–3 mm long, with median lobe generally longest; standard 8–9 mm long, 9–10 mm wide, with claw 2.5 mm long, limb strongly oblate, adaxial surface yellow or orange-yellow with a red and purple-brown flare c. 2 mm wide surrounding throat, abaxial surface with purple-brown to orange-red zone extending almost to margin; throat c. 2 mm wide, squarish; wings c. 7 mm long, 2 mm wide, purple-brown ± throughout; keel c. 6 mm long, 2.5 mm wide, red throughout; vexillary stamen becoming free; anthers c. 0.5 mm long; ovary 4-ovulate, style 1.5–2 mm long. *Pods:* stipe 3–6 mm long; body oblong or oblong-elliptic, 12–20 mm long, 5–7 mm wide, mid-brown, mostly 3- or 4-seeded; upper suture not or only slightly ridged; apex obtuse to subacute, with beak c. 0.5 mm long; outer valve surface with venation faintly raised when dried; inner valve surface with upper suture c. 0.5 mm wide, straight; funicle strongly curved. *Seeds* 3–4 mm long; aril c. 1 mm long, c. 0.6 mm high, with base c. 0.5 mm long; lobe strongly overhanging and strongly curving down to seed surface.

Selected specimens of c. 10 examined: WESTERN

AUSTRALIA: Cave Hill Track, 37 km SW of Widgiemooltha Roadhouse, *B.Archer* 2566, 9.x.2005 (CANB, MEL2288648, PERTH); On "new" Hyden–Norseman Rd, 29.7 km W of Norseman, *W.O'Sullivan* 424, 29.viii.1998 (MEL2090103, PERTH); Lake King, *H.Steedman*, xi.1930 (PERTH); c. 1.6 km S of Hatter Hill, *K.R.Newbey* 3359, 3.ix.1970 (PERTH).

Flowering period: Flowers late winter to spring.

Distribution and habitat: Occurs in inland parts of southern Western Australia between Lake King and Widgiemooltha, north of Norseman (Fig. 5). Grows in red clay-loam, over limestone, in *Eucalyptus flocktoniae* (Maiden) Maiden woodland.

Etymology: The epithet refers to the relatively narrow pods (From Greek: *steno*, narrow and *carpos*, fruit).

Notes: *Goodia stenocarpa* is perhaps closest in morphology to *G. medicaginea* which occurs relatively close by in southern Western Australia, but they differ markedly, especially in indumentum and fruit morphology. All fruiting material seen of *G. stenocarpa* has had a relatively high fruit set. Based on relatively few samples, it appears that the vexillary stamen is free or at least becomes free during flowering. This has not been recorded before in tribe Bossiaseae. Based on photographs provided by a collector, *B. Archer*, *G. stenocarpa* differs from other species of *Goodia* in having a more spreading habit. Details of the inflorescence, persistent stipules and the spreading indumentum and pods are presented in figure 6.

6. *Goodia parviflora* I.Thomps., sp. nov.

A. G. medicaginea F.Muell. *pedicellis brevioribus, floribus minoribus, calycis glabris, foliolis glabris inferne, ovariis glabris, leguminibus oblongis* differt.

Type: Queensland. Sixteen Mile LA, Coomingleh State Forest, SW of Monto, *A.R.Bean* 10159, 19.iii.1996; holotype: MEL 2031555; isotype: MEL 2031556; BRI 654615 (2sheets).

Shrubs to c. 1 m high, with a sparse indumentum on new growth, becoming glabrous or nearly so; hairs appressed, to c. 0.2 mm long. *Stipules* somewhat persistent, lanceolate, to 5 mm long, 0.6–1 mm wide. *Leaves:* petiole 1/3–1/2 of total length; rachis 3–10 mm long; lamina of terminal leaflet elliptic, orbicular, obovate, 10–25 mm long, 8–25 mm wide, with l:w ratio 1–1.3, 3–5 times length of rachis; apex rounded, apiculum to c. 0.5 mm long; upper surface glabrous; lower surface glabrous or with occasional hairs on midrib and margins. *Inflorescence axes* to c. 6 cm long; bracts c. 2 mm long; pedicels 2–3 mm long; bracteoles c. 1 mm long. *Calyx* 2–3.5 mm long, glabrous or nearly so; upper lip with sinus obtuse to c. 0.5 mm deep, 1 mm wide; lower lobes c. 1 mm long, all similar; standard 5–6 mm long, c. 5 mm wide, including claw 3–4 mm long, limb oblate, adaxial surface yellow or orange-yellow with a red and purple-brown flare c. 2 mm wide surrounding throat, abaxial surface with purple-brown



Figure 6. *Goodia stenocarpa*. a. inflorescence; b. stipules and indumentum (a. & b. *B.Archer* 1309 MEL); c. developing pods (*B.Archer* 2566 MEL). Scale bars: a–c = 5 mm.

to orange-red zone extending almost to margin; throat c. 1.5 mm wide, squarish; wings 5–6 mm long, 1.5 mm wide, purple-brown \pm throughout; keel c. 5 mm long, c. 2 mm wide, red throughout; anthers c. 0.5 mm long; ovary 4-ovulate, style 1–1.5 mm long. *Pods*: stipe 5–8 mm long, body c. oblong in profile, 15–22 mm long, c. 10 mm wide, glabrous, tan, up to 4-seeded; base mostly obtuse, upper suture with a wing to c. 0.5 mm high; apex rounded, with beak c. 0.5–1 mm long; outer valve surface with venation usually faintly raised when dry; inner valve surface with suture zone c. 1 mm wide, undulate; funicle strongly curved. *Seeds* 3 mm long; aril 1.3 mm long, c. 1 mm high, with base c. 1 mm long; lobe slightly overhanging, moderately curved.

Selected specimens of *c. 8* examined: QUEENSLAND: Abbeywood via Hivesville near Kingaroy, *D.E.Benham*, 26.x.1954 (BRI); Kroombit Tops National Park, W section, *E.J.Thompson BIL121 & G.P.Turpin*, 30.viii.1995 (BRI, MEL).

Flowering period: Flowers at various times. Mature fruit recorded for March.

Distribution and habitat: Occurs in south-eastern Queensland, between 24°S and 26°S (Fig. 5). Grows in brown or red loamy soils in woodland or forest.

Notes: A rare or perhaps undercollected species characterised by small flowers and short, oblong pods that have a relatively low length:width ratio. In terms of petal markings, the flowers are similar to those of *G. medicaginea* and *G. stenocarpa*. In the absence of flowers or fruit, *G. parviflora* can be distinguished from the other two species occurring in Queensland by its persistent stipules (caducous in *G. lotifolia*) or by its near-glabrous branchlets (current season branchlets moderately hairy in *G. macrocarpa*). Stipules of *G. parviflora* are longer and less hairy than those of *G. macrocarpa*. A portion of the holotype and pods from the isotype are shown in figure 7.

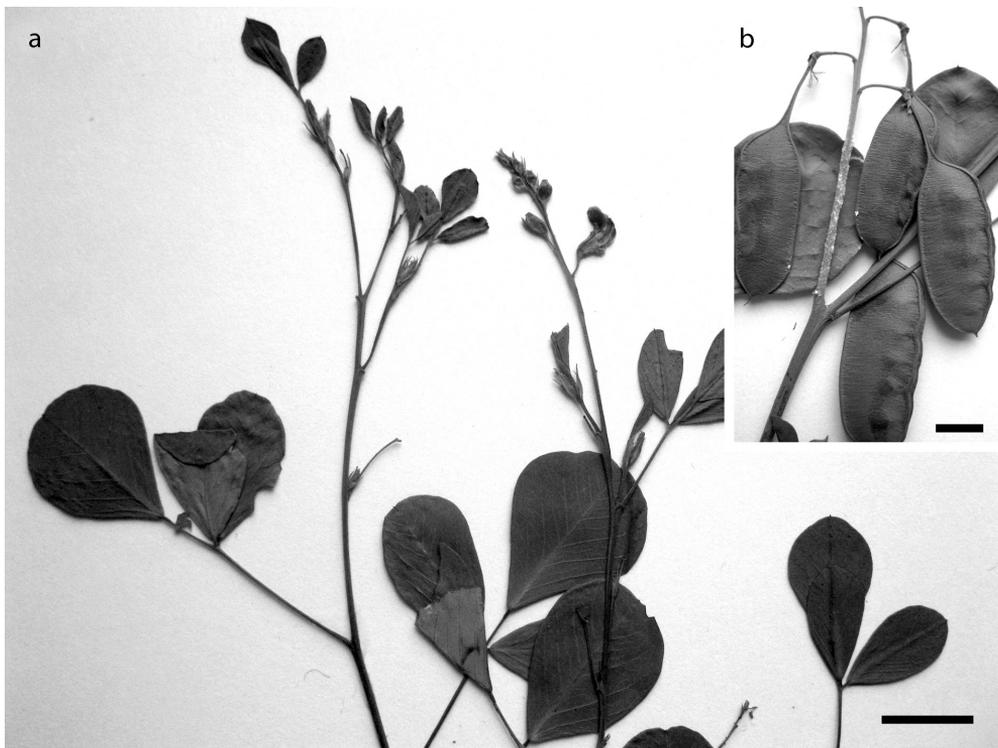


Figure 7. *Goodia parviflora*. a. portion of holotype; b. portion of isotype (a. & b. *A.R.Bean 10159 MEL*, two sheets). Scale bars: a = 10 mm, b = 5 mm.

Excluded names (see Ross 1997 for further details)

Goodia polysperma A.DC., *Rapp. Pl. Rar. Geneve* 2(2): 13 (1824).

Referable to the South African species *Argyrolobium tomentosum* (Andrews) Druce.

Goodia simplicifolia Spreng., *Syst. Veg.* edn 16, 4: 267 (1827).

Referable to *Hovea elliptica* (Sm.) DC.

Goodia retusa Sweet, *Hort. Brit.* 110 (1826).

A nomen nudum of uncertain application.

?***Goodia medicaginea*** Jacques, *J. Soc. Imp. Centr. Hort.* 10: 116 (1864), *nom. illeg.*

An illegitimate name of uncertain application. Ross (1997) indicates that it is uncertain whether Jacques was intending to describe a new species in this case.

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